Rev I
8-12

BOX 2 ASSEMBLY INSTRUCTIONS

1208-1352

These instructions are for all models of 120", 131" or 135" Alpha, Beta and Evo Mount Engines.

CYLINDER AND CYLINDER HEAD INSTALLATION INSTRUCTIONS

A Division of Thiessen Products, INC

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

Box 2 Installation Instructions

CONTENTS:

*Note: Use **Fig. 1** on this page and **Fig.73** in conjunction with the check off list on page 18 & 19 to verify contents prior to proceeding with any installation instructions.*

TOOLS AND LUBRICANT: ***See Fig. 2.***

- ☐ JIMS **No.1235** Piston Ring Expander Tool (Snap On PRS8)
- ☐ JIMS **No.1236** Piston Ring Compressor Set
- ☐ JIMS **No.769** or **No.HD-42317** Piston Pin Circlip Installer
- ☐ JIMS **No.1255** Ring Gap Grinder Tool
- ☐ Feeler gage set, including .0015" through .040" blades
- ☐ 3/8" drive torque wrench (0-25 ft/lbs)
- ☐ 12 point 1/2" deep socket (3/8" drive)
- ☐ 13mm deep socket (3/8" drive)
- ☐ Non abrasive scouring pad & dish soap for cleaning cylinder bores.
- ☐ Clean pair of mechanic's gloves
- ☐ JIMS **No. 4507** Copper Anti Seize Lubricant

Piston Inspection and Preparation
GENERAL NOTES & CAUTIONS:

- Obtain and use a Harley-Davidson Twin Cam service manual specific to your application for general assembly procedures.
- Unwrap and work with the pistons over a padded surface. A half-dozen new, clean shop towels under a T-shirt makes a reasonable low-lint cushion.

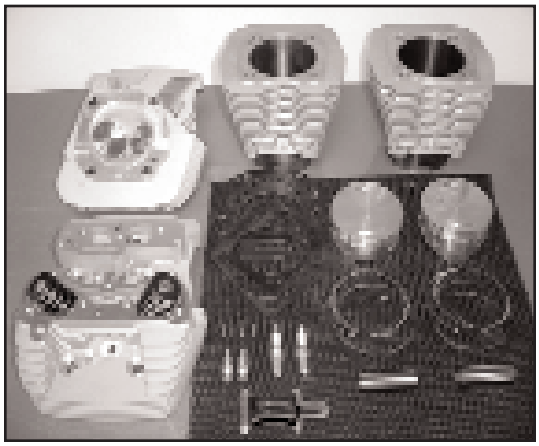

Fig.1 - Kit items

Fig.2 - Necessary tools

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Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Always handle pistons with great care. While they are capable of withstanding extreme acceleration loads, they can also be destroyed by a two-foot fall onto a hard surface.
- Piston ring end gaps must be checked and adjusted if required, use a ring gap tool and do the work away from the engine. Piston ring particles are very hard and should not be allowed anywhere near the open engine. Make sure you wash your hands after adjusting ring gaps or doing any other grinding.
- Avoid the use of sandpaper. Keep all abrasives away from your work area and the internal components of your new JIMS 120, 131 or 135 Race Kit.
- Do not use pressurized air to clean anything. Its use virtually guarantees damaging particles will get into your new engine. If at all possible, use liquid cleaners, soft brushes and clean lint-free towels instead.

STEP 1: Piston inspection

- There should be no dents, dings or gouges on any surface of the pistons. Pay particular attention to edges and corners especially the corners formed by the piston pin hole and the sides of the pistons. They should be smooth with no nicks or deformations. If any burrs are noted please contact the JIMS Tech Department (805-482-6913)
- Inspect the piston ring grooves for any deformations.
- Clean the pistons and then proceed to the next step.

Piston and ring installation information:

- The 120" flat top piston is shown in Fig. 4, and the 131"/ 135" with a recessed top is shown in Fig. 5. Both the 120" and 131" / 135" piston sets have a rear piston with a notch as shown in Fig. 3 on the skirt. In the following installations we show figure photos of 120" the ring sets. The installation of the 131" or 135" ring sets is the same procedure for installation as 120" sets.

Note: 120", 131" or 135" ***Piston orientation***

There is a front and a rear piston. They are not the same and must be installed correctly. **See Fig. 3.**

- Both 120", 131" and 135" pistons have valve reliefs machined into their tops. The intake valve reliefs are clearly larger to clear the 2.080" diameter intake valves. ***See Fig.4 and Fig.5.***

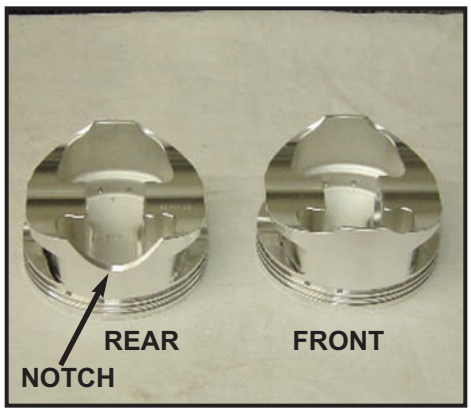

Fig.3 - Inspect pistons

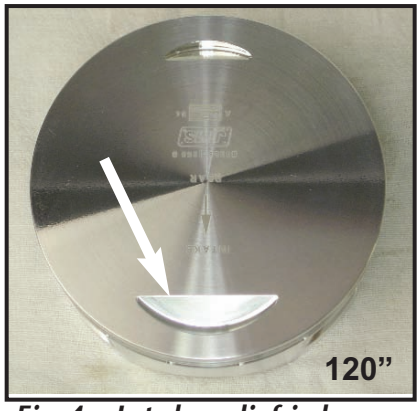

Fig.4 - Intake relief is larger

Fig.5 - Intake relief only

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Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- The rear piston has a notch on the bottom of the intake side of its skirt. ***See Fig.6.***
- The rear piston's notch goes toward the front, or intake side of the engine.
- The front piston's intake valve relief points toward the rear of the engine. ***See Fig.7.***

Fig.6 - Rear only piston notch

STEP 2: Piston Pin Clip Insertion
IMPORTANT NOTE:

- Piston pin clip insertion must be done carefully to avoid damaging the corners of the piston pin hole.
- A crushed corner is a collection of cracks. At the high stress levels this engine was designed to withstand, one or more of those cracks could grow and eventually result in piston failure and severe engine damage.
- Use Harley-Davidson tool No.42317 or JIMS Tool No.769 Piston Pin Circlip Remover / Installer if you have one. This is an excellent tool and makes the task simple and safe for the pistons. This tool can only be used for left side of piston.
- Lock ring is to be installed on the left side at this time. ***See Fig 7***
- It is very important you do not scratch or gouge the piston pin bore.
- Place the piston on the clean pad. If using the Harley tool, follow the directions in your Harley shop manual to insert a piston pin clip into the left side of each piston. ***See Fig 8 & 9.***
- Check to make sure the wrist pin clip is fully seated in its groove.

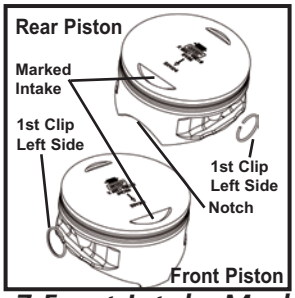

Fig.7 Front Intake Marked

Fig.8 - Install left clip

STEP 3: Piston Ring Inspection and Preparation Preparation

- Wipe excess oil from the piston rings.
- Run the rings through your fingers to feel for any burrs.

NOTE: If burrs are discovered, see Appendix 1 (pg.18) for instructions on deburring. You must Wash rings after deburring.

- Lightly lubricate with clean H-D 20W-50 oil and slip one piston pin into a piston (either piston will do).

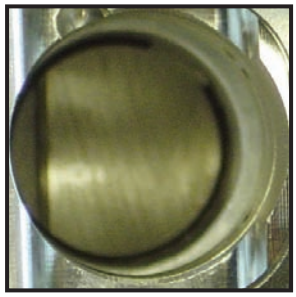

Fig.9 - Fully seat left clip

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Place a cylinder on the bench, top end up.
- The cylinder's bore should be clean to the touch and lightly oiled. ***See Fig. 10.***

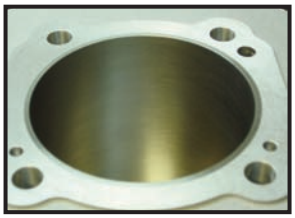

Fig.10 - Clean cylinder bore

End Gap Measurement ***See Fig. 11.***

- Piston Ring end gap range:
- Top ring: .017" to .022"
- Second ring: .022" to .030"
- Oil control rails: .015" to .030"
- Record your end gap measurements in the chart on page below. Tilt and start a piston ring into the bore. The most common and perhaps easiest way to do this is to first insert the side of the ring opposite the gap. Then, flex each ring end into the bore. Use your fingers to control twist as you insert the ring. ***See Fig. 12.***
- When the ring is in the bore, use the piston to force it down the bore until the piston pin is slightly below the top of the cylinder. ***See Fig. 13.***
- Remove the piston.
- The piston ring is now square with the bore and positioned for end gap inspection.
- Use a feeler gage as pictured to measure the width of the gap. You may stack two blades if necessary. ***See Fig. 11.***
- Remove each ring by hooking it with a finger on the side opposite the gap and pulling smoothly and gently out of the cylinder bore.

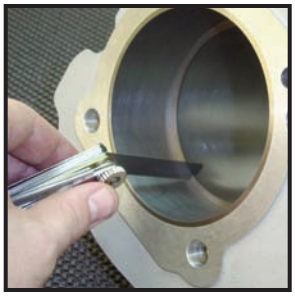

Fig.11 - Feeler gauge gap

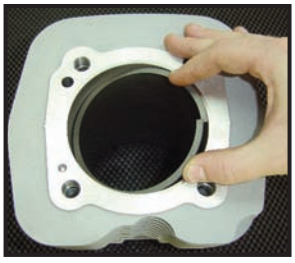

Fig.12 - Carefully twist in

	Front Piston	Rear Piston
Top Ring		
Second Ring		
Oil Control Rails		

- Start measuring with all piston rings to one side of the cylinder.
- After each ring is checked:
- Place rings having passed the end gap test on the opposite side of the cylinder.
- Place each of those failing the end gap test on a piece of paper and write their measured end gap on the paper.
- When you have finished, separate and cover the piston rings not requiring additional fitting.

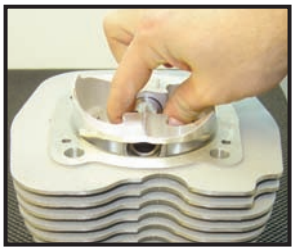

Fig.13 - Press ring down

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

STEP 4: End Gap Adjustment:

- It is unlikely you will need to adjust the first and oil control ring end gaps. However it is likely you will have to adjust the second ring end gap, if you do, the amount will be very small. Please do not hurry the procedure and remove only a little material at a time.
- For the best result, use a piston ring gap tool to remove metal from the ends of the rings.
- Do not work near the open engine.

Piston ring gap tool:

- Determine how much material must be removed from the ends of the ring. It will probably be only a few thousandths of an inch. If, say, a 2nd compression ring's end gap was .013" then you would need to remove a total of .004" from the ends to meet the minimum gap standard of .017".
- Remember, JIMS® No.1255 piston ring end gap tools file both ends of the ring, and material removal can be very rapid.
- Fit the ring into the tool according to the tool's instructions.
- Gently rotate the cutter and remove a very small amount of ring material. ***See Fig. 14.***
- Remove and clean the ring. Deburr if needed. Then, re-insert it into the bore. Square it using the piston as before and measure the end gap.
- Check the end gap often as you work, especially when you work with your first ring.

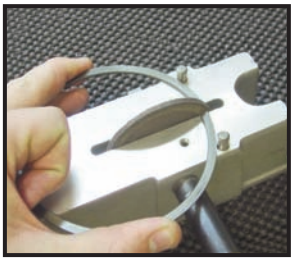

Fig.14 - Rotary ring cutter

Fig.15 - Square ring ends

Flat jeweler's file:

- It is not necessary to remove material from both ends.
- It is important to get the filed end square. When the two ends are brought together, they should be as nearly parallel as possible. ***See Fig.15.***
- Devise a method to clamp or control the piston ring as you file it. You could use a clean smooth-jawed vise, with soft jaws or a machinist's vise. ***See Fig. 16.***
- An alternate method might be to use a flat, hard, sharp cornered object like a thick glass plate or even a piece of hard wood. Place the ring end over the edge of this piece and hold it in place with the pressure of your hand as you gently remove a bit of material with the file.
- Do not be tempted to do the work in the air using your hand as the vise.
- As you start to file, be sure the file is at right-angles to the end of the ring. Make the angle between file and ring square from both the top and side. ***See Fig. 17.***

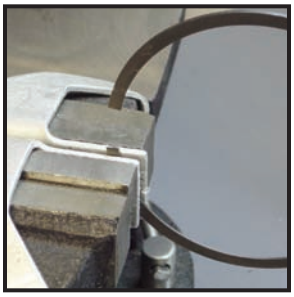

Fig.16 - Clamp securely

Fig.17 - Square ring end

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Use light pressure as you file, just enough to keep it cutting. Let the file do the work.
- Clean the ring and re-check the end gap often as you work, especially with your first ring.
- Deburr the piston ring ends you have modified
- A light back-stroke of the file across a burred corner should knock the burrs down. See Appendix One. Page 18
- Do not be tempted to use abrasives. Your fine file is good enough.
- When you have finished all the rings, put the file away and thoroughly clean and lightly oil the piston rings. Be especially careful to remove any magnetic steel particles that may be clinging to the rings. A clean damp cloth works well.
- If you had to adjust the ring end gaps be sure to deburr the ring ends prior to installation.
- Cover cylinder and set aside as you proceed to step 5.

Fig.18 - Clean & inspect

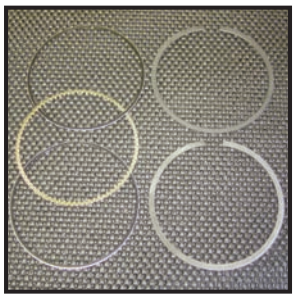

Fig.19 - Ring set

STEP 5 Piston Ring Installation ***See Fig. 18.***

- Wash all piston rings in warm water and dish soap prior to installation on the piston.
- Wear safety glasses while installing all piston rings.
- Install the rings from the top of the pistons.
- Take care not to scratch the piston as you install the rings.
- Place a piston top-end up, skirt-end down on your clean pad.
- Select one set of rings. (A set consists of two oil control rails, one expander spring, one second ring, and one top ring). ***See Fig. 19***
- Installation: Oil Control Ring Sets ***See Fig. 20***

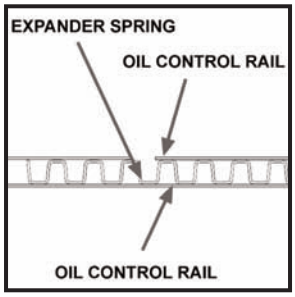

Fig.20 - Oil control rings

Note: The expander spring can be installed either way; there is no top or bottom.

- The oil control rails can be installed either way; there is no top or bottom.
- Install the oil ring expander spring.
- Make certain the ends of the expander spring butt against one another and do not overlap. ***See Fig. 21.***
- Work one of the oil ring rails down over the piston with your fingers.
- It is okay to slightly twist the ring as you do this. Place the first rail on the lower side of the expander spring. ***See Fig. 22.***
- Position its gap about 90-degrees from where the ends of the expander spring meet.

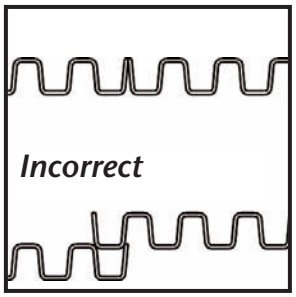

Fig.21 - Proper ring butt

Fig.22

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Install the second rail with its gap roughly opposite the gap of the first rail.
- Make sure the expander spring ends butt and do not overlap.

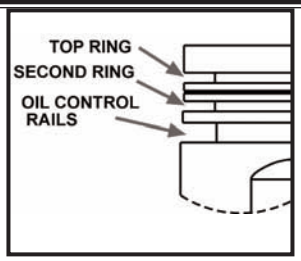

Fig.23 - Ring placement

Installation: Compression Rings
Identification:

- The top two rings are different and each have an "up" side and a "down" side. They must be installed correctly.
- The first or top (***Fig. 23 & 24***) ring has a light colored, hard chrome plated sealing edge face. It has a very small dot on its top about half-an-inch from one end. Also, one of its inside edges is beveled. Both the dot and the bevel go up, toward the top of the piston.
- The second ring is very dark, almost black in color. It is marked with dot or "TOPC" about 1/2" from one end. This identifies the top side of the ring. Bevel goes down. ***See Fig. 25.***

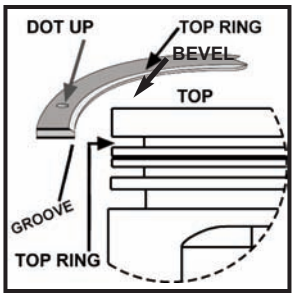

Fig.24 - Note color, bevel & dot

Installation: Second Ring, ***See Fig. 25***

- Select a second ring. Remember, it is nearly black.
- Make sure the top of the ring is facing up. Remember, the top of the second ring has a dot or a "TOPC" about 1/2" from one end.
- Grasp the ring with your piston ring expander tool (JIMS No.1235). ***See Fig. 26***
- With the piston supported on the clean pad, gently expand and guide the ring over the top of the piston and into its groove. Do not expand the ring any more than is needed to get it over the piston.

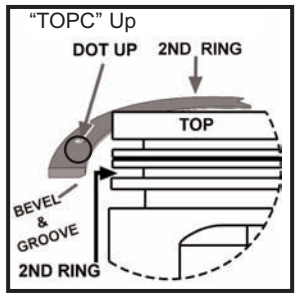

Fig.25 - 2nd ring install

Top ring installation: ***See Fig. 27***

- Select a 1st compression ring. Remember, it has a light colored, hard chrome plated sealing edge face, a smaller dimple and a beveled inside edge.
- With the dimple and bevel up, grasp the ring with the piston ring expander tool.

Fig.26

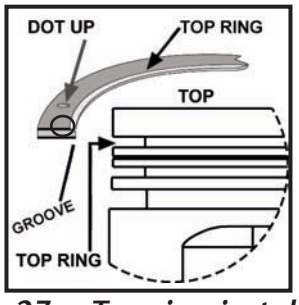

Fig.27 - Top ring install

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Expand the ring just enough to clear the piston and guide the ring into its groove. ***See Fig. 28***
- Repeat the above procedure to install the remaining piston rings on the other piston.
- Check the fit between piston rings and piston ring grooves by sliding each ring around in its respective groove. There should be no tight spots. Clean pistons and proceed to the next step: ***See Fig. 29.***

Fig.28 - Carefully expand rings

STEP 6: Cylinder Inspection and Preparation

- Inspection
- Inspect the fins and spigots of both cylinders for damage
- Closely inspect the cylinder bores.
- There should be no scratches other than the normal hone cross hatch.
- Cleaning

Fig.29 - Inspect ring grooves

Note: Be very careful when scrubbing the cylinders to avoid cutting your hand.

- Soak the non-abrasive cleaning pad in hot water.
- Wearing your clean mechanics gloves thoroughly scrub the cylinder bores with the soapy pad and hot water. ***See Fig. 30.***
- Rinse the bores with clean hot water until you can wipe the bore with a clean white cloth and show no signs of dirt.
- Dry with a low lint cloth or towel.
- Immediately coat the cylinder bores with a light film of clean H-D 20W-50 oil to prevent rust.
- Clean gasket surfaces (base and head) with a lint free cloth and denatured or isopropyl alcohol. (make sure you clean all oil from the gasket surfaces.)

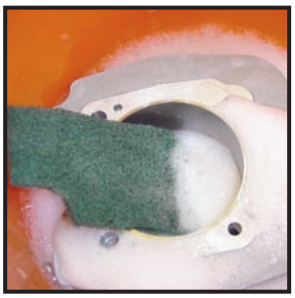

Fig.30 - Cleaning pad, soap, & water

STEP 7: Piston/Cylinder Assembly

Note: Please read the following notes carefully.

- Piston Ring Orientation:
  IMPORTANT: JIMS 120, 131 or 135 Race Kit cylinders each have two cutaways in their skirts. ***See Fig.31.***
- No piston ring end can be allowed to drop into either of these cut aways.
- If a piston ring end gets into one of the cutaways and the piston moves upward during installation, the end may catch and destroy the ring.

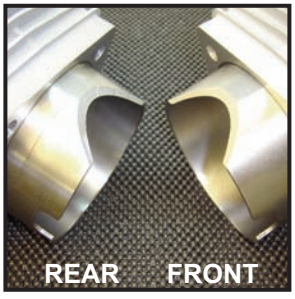

Fig.31

KEEP IT CLEAN!

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- If you follow our piston installation directions, the piston rings will be protected by keeping the ring gaps out of the cylinder spigot cut-aways. ***See Fig. 37.***
- Cylinder differences and orientation: The front and rear cylinders are different. Both cylinders have reduced fin width on their right sides to allow for the pushrod tubes.
- Both cylinders have notched skirts.
- The front cylinder's notch goes toward the rear of the engine. (toward the center of the "V"formed by the cylinders) ***See Fig. 32.***
- The rear cylinder's notch goes toward the front of the engine. (again, toward the center of the "V" formed by the cylinders)
- When the front cylinder is correctly placed, its shortened fins will be on the right and the spigot notch will be toward the rear of the engine.
- When the rear cylinder is in place, its shortened fins will also be on the right but the spigot notch will be toward the front of the engine.
- Both cylinder notches go toward the center of the engine; they face each other.
- Piston differences and orientation: The front and rear pistons are different.
- The rear piston has a notch at the bottom of its skirt.
- The rear piston's notch goes toward the front of the engine. ***See Fig. 33.***
- Toward the center of the "V" formed by the cylinders.
- The front piston does not have a notched skirt. ***See Fig. 34.***
- The front piston's larger valve pocket goes toward the rear of the engine, the intake side of the cylinder.
- Toward the center of the "V" formed by the cylinders.

Installation Procedure:

- The JIMS 131", 120" or 135" Race Kit piston installation procedure differs from that found in Harley-Davidson's Twin Cam shop manuals.
- Our alternate procedure is commonly used and preferred by many engine builders.
- Assembly: Rear Piston/Cylinder
- Place the rear cylinder on your bench. Spigot, or bottom end up. ***See Fig. 35***
- Place the rear piston assembly on your bench.
- Top-end up ***See Fig. 36.*** Arrange the piston rings so that the end gaps do not line-up (stagger alignment).

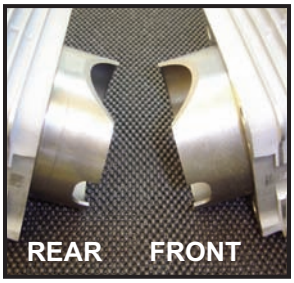

Fig.32 Cylinder spigot notches

Fig.33 Note piston notch

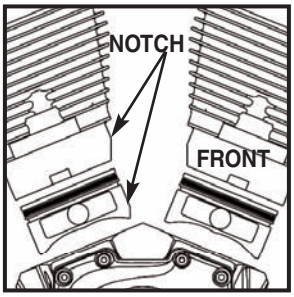

Fig.34 Rear piston notch

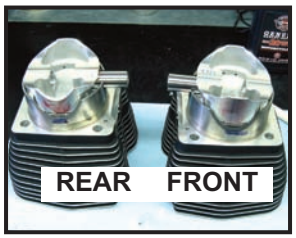

Fig.35 - Align correctly

Fig.36 - Piston up

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Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- *See Fig. 37* for proper front and rear piston ring placement. This placement is very critical to piston installation, be certain you have duplicated ring position per the diagram or piston and ring damage can occur.

Note: If you find it useful, take a magic marker and duplicate the numbers from the diagram onto your piston. Be sure you have the rear cylinder with the rear piston.

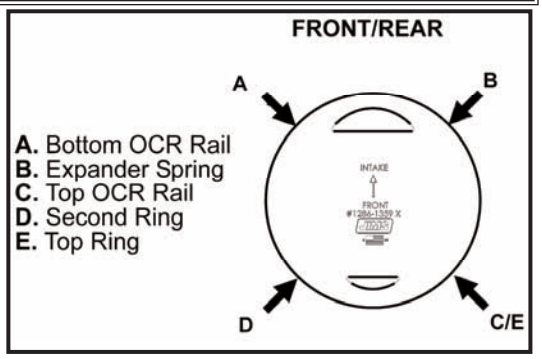

Fig.37 - Arrange ring gaps in this pattern

- Fit the piston ring compressor, with a light film of clean H-D 20W-50 oil, over the piston just far enough to capture all the rings. ***See Fig. 38.***
- Align the ring compressor's handle with the smaller exhaust valve relief. ***See Fig. 39.***
- Tighten the compressor.
- Confirm all rings are compressed. ***See Fig. 39.***
- Lube skirt with assembly lube, and slide the piston, into the bore of the cylinder. ***See Fig. 40.***
- Place the ring compressors handle opposite the larger cylinder spigot notch. ***See Fig. 40.***
- Be careful to avoid damaging the piston skirts.
- Carefully push the piston into the bore with the palm of your gloved hand. The ring compressor will release when the piston is completely in the bore. ***See Fig. 41***
- Turn each piston to the right and left approximately one (1) inch, this movement should be smooth.

Fig.38 - Proper ring clamping

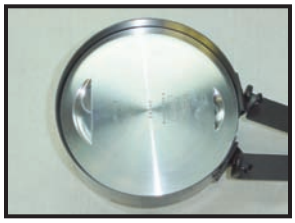

Fig.39 Compress rings

Assembly: Front Piston/Cylinder

- Use the same assembly technique as the above steps. Go back to step 7 and perform the same steps for other cylinder and piston.
- Be sure you have the Front piston with the Front cylinder.

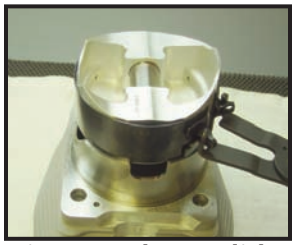

Fig.40 Lube & slide

Note: If you are not going to install the cylinders on your lower end assem bly at this time you must bag the cylinders using one of the supplied clean plastic bags.

STEP 8: Cylinder Installation

Note: This step is best done by two people.

Fig.41 - Use hand to push

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- Work from the right side of the short block.
- One person should hold and position each piston/cylinder assembly. ***See Fig. 42***
- The second can then align the connecting rod with the wrist pin and insert the pin into the rod. **See Fig. 43**
- Uncover the short block and position it with room to work comfortably.
- Make sure the cylinder base gaskets are properly positioned.

Fig.42 - Assistant holds assy.

Note: Do not apply any sealant to gasket.

Note: Oil return hole position in case, make sure it lines up with the base gasket, as pictured. See Fig. 44.

Fig.43 - Insert wrist pin

- If you are using the recommended JIMS No.1022 Alpha , or No.902 Beta Twin Cam Engine Stand, or a similar stand, we recommend you bolt it down before proceeding. The engine is going to get taller and heavier and needs to be secured.
- Carefully shield the crankcase so foreign objects, like a dropped piston pin clip, cannot fall into the engine.
- You can slit and re-install the original foam shields JIMS used to hold and isolate the rods. This technique centers the connecting rod and makes cylinder installation a bit easier. **See Fig. 45**
- Other materials such as clean lint free towels can also be used.

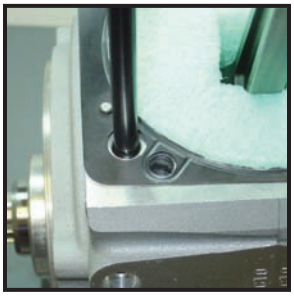

Fig.44 - Oil hole aligned

Installation: Rear Cylinder

- Lay the rear piston/cylinder assembly on its side.
- With the small spigot cutaway up. Rotate the piston so the wrist pin hole aligns with the cutaway. **See Fig. 46.**
- Gently push the piston down the bore until the pin hole is exposed enough to receive the pin.
- Pre-lubricate the piston's wrist pin hole by inserting a lubed wrist pin with assembly lube into the pin hole. Slide the wrist pin in until it bottoms out on the left side wrist pin clip, and then remove the wrist pin. **See Fig. 46.**
- Rotate the crankshaft until the rear connecting rod is at the top of its travel (TDC).

Fig.45 - Use foam support

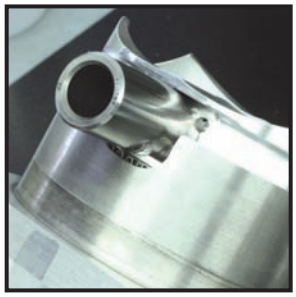

Fig.46 - Lube wrist pin

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- Lubricate the wrist pin bushing with assembly lube. ***See Fig.47.***
- Carefully position the cylinder over the rear studs so the short fins are on the right, toward you. The spigot bevel will be toward the front of the engine. ***See Fig. 48.***

Fig.47 - Lube rod pin bushing

CAUTION: Be careful not to scratch the base gasket sealing surface on the bottom with the cylinder studs during assembly. Be careful not to bend the cylinder studs during cylinder installation.

- Lower the cylinder assembly over the studs while guiding the rod into the piston.
- Align the wrist pin with the wrist pin bushing.
- Slide the pin through the rod until it is stopped by the left, far piston pin clip. ***See Fig. 49.***
- Install the remaining pin clip. Start one end of the clip into the wrist pin hole. Use a hard plastic rod, or wooden dowel to work the clip fully into its groove.

Fig.48 - Assistant holds assy.

Note: Be sure to wear your safety glasses when installing wrist pin clips. See Fig. 50.

Fig.49 - Insert wrist pin

- Verify the clip is fully seated in its groove. ***See Fig. 51.***

Important: Be very careful not to gouge, nick, dent or otherwise deform the corners of the wrist pin hole.

- Remove the material protecting the case bore.
- Apply a thin film of the supplied assembly lube to the front and back of the piston skirt.
- Inspect the mating surfaces of the base gasket and cylinder to be sure they are clean.
- Gently slide the cylinder down until it seats on the base gasket.
- The base gasket normally has a little curl so check that the gasket is located on the dowels as you lower the cylinder into position.

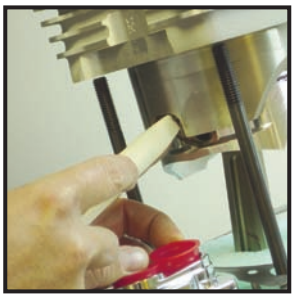

Fig.50 - Insert ring clip

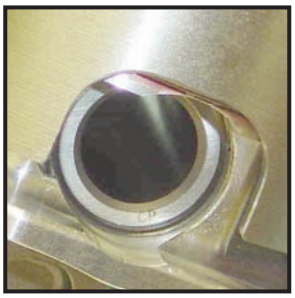

Fig.51 - Verify fully seated

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Clamp the cylinder down so it will not move as you rotate the crank shaft. ***See Fig. 52***
- Slide a two inch length of stiff tubing or other spacer material over a short head bolt.

Note: Use a short, 1/2" I.D. oil, or gas hose.

- Thread the bolt onto one of the cylinder studs until the spacer is finger-tight against the cylinder. ***See Fig. 53.***
- Installation: Front Cylinder ***See Fig. 54.***

Note: Prior to front cylinder installation pour 1/3 of a quart of clean 20W-50 H-D oil over the crankpin area. See Fig. 55.

- Rotate the crankshaft until the front connecting rod is at TDC. ***See Fig. 56***
- Front cylinder installation is precisely similar to the rear's.
- There are a couple of differences in the parts:
- The notch on the front cylinder spigot goes toward the rear of the engine.
- The large valve relief in the top of the piston goes toward the rear of the engine.
- The front piston has no skirt notch. ***See Fig. 34.***

Fig.52 - Verify gasket aligned

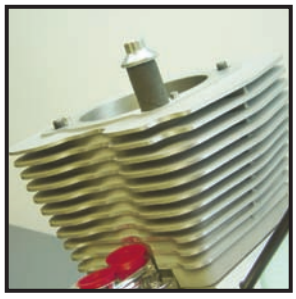

Fig.53 - Clamp cylinder

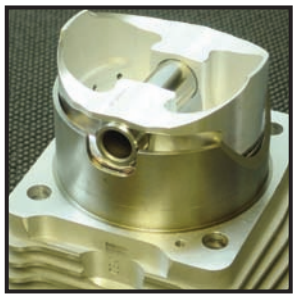

Fig.54 - Repeat for front

Installation: Cylinder Dowel Pins (No.1286-1387)

Note: Make sure the tappet block cover bores remain sealed so nothing can fall into them.

- Lightly lube the larger beveled side of the dowel pin with clean H-D 20W-50 oil.
- Install 2 dowel pins per cylinder into cylinder gasket surface area as shown in ***Fig. 57.***

Fig.55 - Pour 1/3 quart oil

Step 9: Cylinder Head Inspection and Assembly

Important Note: *Any CNC ported heads used on JIMS 120, 131 or 135 Twin-Cam engines*

All of JIMS heads found on 120, 131 or 135 engine's are powder painted either in black or silver prior to CNC porting. When the CNC porting process is done some paint may remain inside the intake or exhaust ports. Any paint that may be left inside ports will not affect airflow or performance in any way. **This is not a defect. do not try to remove it.**

- Inspection ***See Fig. 58***
- All sealing surfaces must be free of dents, deep scratches or foreign material.
- Clean the cylinder gasket sealing surface with a lint-free cloth and denatured/isopropyl alcohol and allow the surface to dry prior to installation. This is particularly important with the JIMS 120, 131 or 135 Race Kit as its special gaskets are hard and do not conform around deformities like the softer stock gaskets.

Fig.56 - Front rod TDC

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- Of course the fins should also be straight and undamaged.
- Any small chipped paint areas can be touched up later.
- Inspect the head gaskets. ***See Fig. 60.***
- They should be smooth and clean.
- A small amount of curl is okay.
- The surface coating should be intact.
- You will find a small area of machined fins on the spark plug side of each head, as pictured. This is normal. ***See Fig. 59***

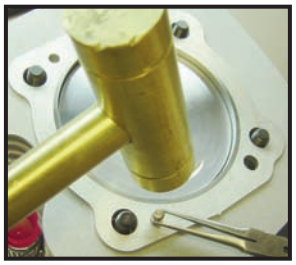

Fig.57 - Gently tap dowel pin

Head Gasket Installation
VERY IMPORTANT NOTES:

- The head gaskets can be installed either of two ways; only one is correct.
- Incorrect installation will close-off the oil drain hole from the head.
- Incorrect head gasket installation requires a partial engine tear-down to fix.

Fig.58 - Inspect heads

Head Gasket Orientation:

- The gaskets have a seventh hole about 3/8" in diameter, near one of the stud holes.
- Install each gasket so this hole is over the oil drain hole in its cylinder. ***See Fig. 60.***
- The front cylinder's drain hole is located at the left-front. ***See Fig. 61***
- The rear cylinder's drain hole is located at the left-rear. ***See Fig. 62***
- Make sure each cylinder and gasket is clean, and free of oil.
- Place the gasket over the locating dowels (Dry).

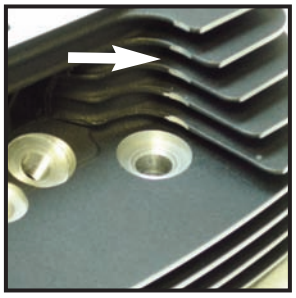

Fig.59 - Paint machined fins

Note: Do not apply sealant to gasket.

- Double check to make sure the oil drain hole in the gasket aligns with the oil drain hole in the cylinder.

Fig.60 - Note oil hole

Note: The JIMS 120, 131 or 135 Race Kit gaskets do not need or use O-rings. The gasket coating and embossment seals the surfaces and eliminates oil leaks.

Cylinder Head Installation

- Clean the head gasket sealing surface with a lint free cloth and denatured/ isopropyl alcohol and allow the surface to dry prior to installation.
- Lightly lubricate, with the supplied moly lube, the threads of the cylinder studs.

Fig.61 - Note oil hole

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

Note: Do not allow any lube to contact the gasket or gasket surfaces.

- Select a head and place it over the locating dowels and onto the cylinder.
- Be sure the head gasket is properly placed. ***See Fig. 63.***

Head orientation: ***See Fig. 66.***

- The Screamin' Eagle® logo goes to the right of the engine.
- The pushrod holes go to the right of the engine.
- The intake port goes toward the center of the engine.
- Make sure the head is fully seated on the cylinder.
- Lay out the head bolts within easy reach: two short and two long bolts are used for each head.
- Lightly lubricate, with copper anti seize lube, the internal threads of each bolt.
- Lightly lubricate, with copper anti seize lube, the underside of each head bolt flange. ***See Fig. 64.***
- This is the flat area under the bolt head that contacts the cylinder head.
- Thread the two short bolts into the stud holes on the left (spark plug) side of the head.
- Thread the remaining longer bolts into the other two
- Gently snug all four bolts (finger tight).
- Repeat step on page 14. See "**Very Important Note**" to install the remaining head.
- Remember to align the hole in the gasket with the cylinder's oil drain hole.

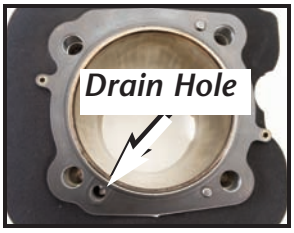

Fig.62 - Gasket alignment

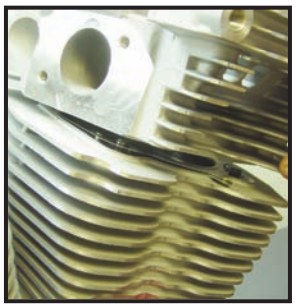

Fig.63 Verify gasket alignment

Fig.64 - Moly lube

Cylinder Head Torque. ***See Fig. 65.***

Note: Follow the tightening sequence exactly as it is described below. Deviation from the procedure can result in gasket failure, or severe damage to the heads and cylinders. If you have any questions regarding the torque sequence please contact JIMS Tech Support at (805-482-6913). See Fig. 66 (Pg. 17)

Fig.65 - Follow torque specs

- After all head bolts are finger tight, follow the sequence in ***Fig. 66*** (Pg.17) to torque the heads as described below with a 1/2" 12 point deep socket.
- Torque each lubed head bolt to 8 ft/lbs, following the sequence in ***Fig. 66.***
- Continuing in the same sequence, torque each bolt to 18 ft/lbs.
- With a grease pencil or similar marker, mark a line on the smooth surface of all 8 head bolts, continuing this line down to the head casting surface, as pictured in ***Fig. 67.***

Fig.67 Mark bolt and head

Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

- These marks will be used as a guide to tighten all head bolts an additional 1/4 of a turn (or 90 degrees). ***See Fig. 68.***
- After all 8 head bolts have been tightened an additional 1/4 turn (or 90 degrees), all 8 head bolts need to be loosened to allow seating-in of the gaskets.
- Loosen the head bolts using the same sequence described in ***Fig. 66,*** 1/4 of a turn at a time until each is loose enough to turn with your fingers.
- After all 8 head bolts can be turned with your fingers start the torque sequence again.
- Torque each head bolt to 8 ft/lbs, following the sequence in ***Fig.66.***
- Continuing in the same sequence, torque each bolt to 18 ft/lbs.
- Make a fresh mark on the head bolts as pictured in ***Fig. 67.***
- Tighten all 8 head bolts in sequence an additional 1/4 turn or 90 degrees as pictured in ***Fig. 68.***

Fig.68 - 1/4 turn

Fig.69 Compression release

Fig.70 - Thread spark plug

JIMS 120, 131 or 135 Race Kit torque sequence

Year	Model	1st	2nd	3rd	Loosen	4th	5th	6th
2003-4	"A" & "B"	8ft/lbs	18ft/lbs	1/4 turn	Loosen	8ft/lbs	18ft/lbs	1/4 turn

STEP 10: Compression Release Installation

Preparation:

- Unwrap and clean the threads of the compression releases. ***See Fig. 69.***
- Install the sealing washers.
- Lightly lubricate, with copper anti seize lube, the threads and sealing washers.
- Make sure the threaded holes in the heads are clean and empty.

Installation:

- Thread a compression release into its head.
- Using your 13mm deep socket torque to 12 to 18 ft/lbs.
- Repeat for other compression release.

Note: Before proceeding, apply a small amount of moly lube to the spark plug threads and the spark plug threads in the head, and then thread the spark plugs a few turns into the heads.

- The purpose of this is to prevent anything from falling into the cylinders.
- Do not torque them at this time as they will be removed to make the engine easier to rotate during pushrod installation and adjustment. ***See Fig. 70***

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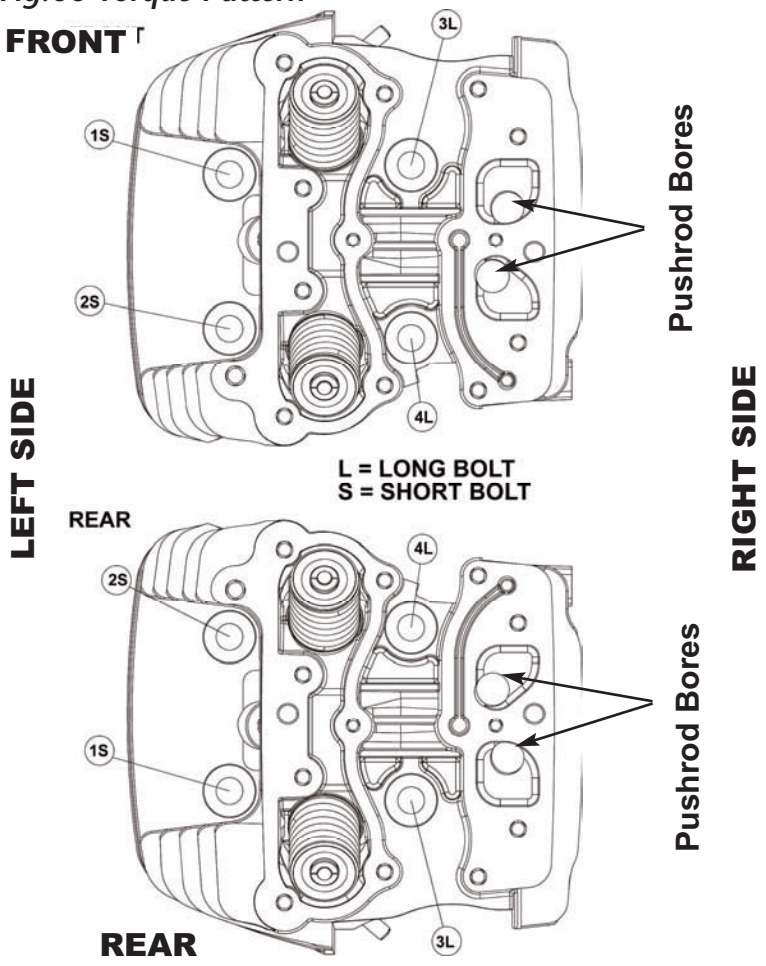
Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

STEP 11: Center Case Bolt Torque Settings

Please Note: The following case bolt re-torquing procedure contains a specification for the center case bolt that is unique to your new JIMS 120", 131" or 135" Race Kit.

- The 1/4" center case bolt must be retorqued prior to initial start-up, and again after the engine has cooled.
- All case bolts must be re-torqued once the engine has cooled after initial start up. Retorquing must be continued after each heat cycle until the case bolts cannot be torqued any further.
- Refer to your Twin Cam "A" or "B" H-D Service Manual for the proper tightening sequence and torque specifications for all case bolts with the following exception: ***Important: The torque value for the center case bolt is 135-155 in/lbs.***
- Center case bolt torque specification: During each case bolt re-torquing sequence the H-D prescribed torque specification for the 1/4" center case bolt (#1 in the H-D Service manual diagram) should be amended to 135-155 in/lbs. ***See Fig. 71*** for Engine "A" & 72B for Engine "B".

Fig.66 Torque Pattern



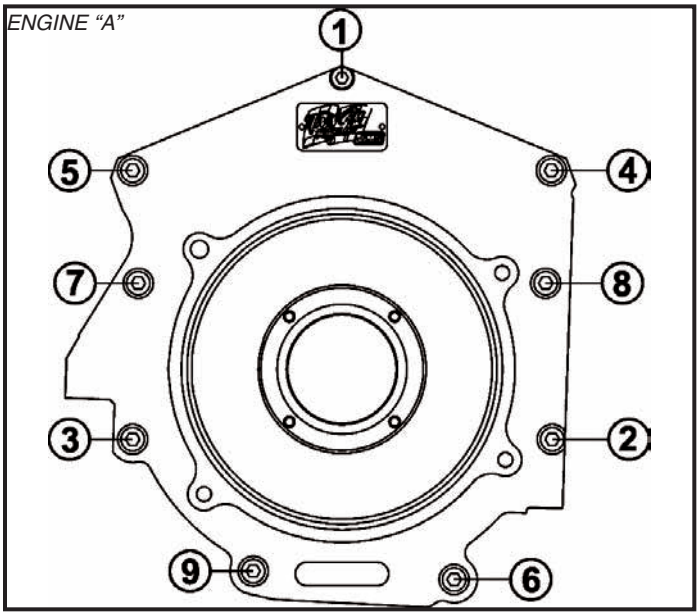


Fig.71 - Case torque sequence

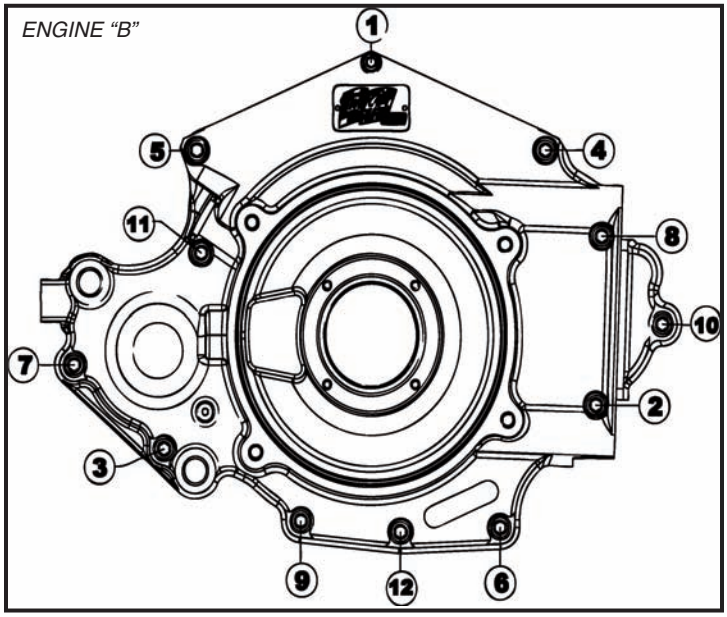


Fig.72 - Case torque sequence

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Instruction Appendices

Appendix One
Piston Ring Burr Removal:

Remove any burrs with a fine jeweler's file.

NOTES: Do this work away from the engine assembly.

- *Piston ring filings are extremely hard and dangerous to the fine internal surfaces of your 120, 131 or 135 engine, especially its roller and needle bearings.*
- *Piston ring filings are often slightly magnetic and may be difficult to remove from the rings or steel tools, like the jeweler's file you might use to adjust end gap.*
- *Piston ring end gap filing creates very sharp corners on the rings. These must be removed before inserting the rings into the cylinder bores.*
- *It is not necessary or desirable to bevel or break the corners of a modified piston ring. Merely remove the burrs*

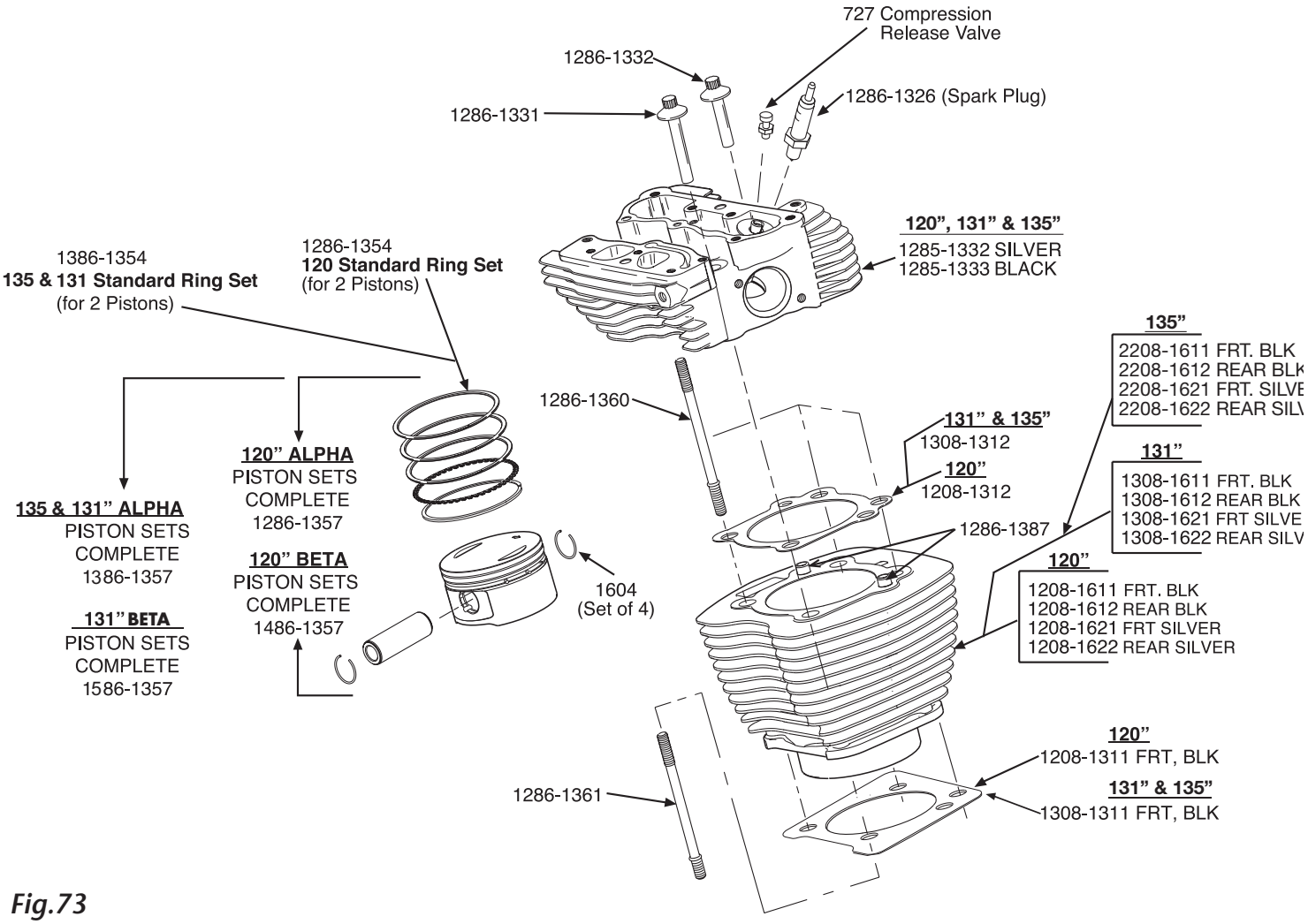

Fig.73

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Instruction Sheet For Box 2 120", 131" or 135" Engine Assemblies Or Engine Race Kits

BOX 2 Materials Check-Off Sheet		
Part No.	**Description**	**Qty.**
1208-1611	120" Cylinder, Front, 4-1/8", Black	1
1208-1612	120" Cylinder, Rear, 4-1/8", Black	1
1208-1621	120" Cylinder, Front, 4-1/8", Silver	1
1208-1622	120" Cylinder, Rear, 4-1/8", Silver	1
1308-1611	131" Cylinder, Front, 4-5/16", Black	1
1308-1612	131" Cylinder, Rear, 4-5/16, Black	1
1308-1621	131" Cylinder, Front, 4-5/16, Silver	1
1308-1622	131" Cylinder, Rear, 4-5/16, Silver	1
2208-1611	135" Cylinder, Front, 4-5/16", Black	1
2208-1612	135" Cylinder, Rear, 4-5/16", Black	1
2208-1621	135" Cylinder, Front, 4-5/16", Silver	1
2208-1622	135" Cylinder, Rear, 4-5/16", Silver	1
1285-1333	135", 131" & 120" Head Set, Frt & Rear, Black	1set
1285-1332	135", 131" & 120" Head Set, Frt & Rear, Silver	1set
1286-1357	120" Piston Set, Std. Size with Rings All Alpha's	1set
1486-1357	120" Piston Set, Std. Size with Rings All Beta's	1set
1386-1357	135" & 131" Piston Set, Std. Size with Rings All Alpha's	1set
1586-1357	131" Piston Set, Std. Size with rings, all Betas	1set
1286-1387	Dowel Pin, Cylinder Top, 1/4"x1/2"	4
727	Valve, Compression Release	2
1286-1326	32329-97, Spark Plug, 6R12PP Double Platinum	1set
1208-1312	120" Gasket Set, Head	1set
1208-1311	120" Gasket Set, Base	1set
1308-1312	131" & 135" Gasket Set, Head	1set
1308-1311	131" & 135" Gasket Set, Base	1set
1286-1395	Bag, 24x24	1
1208-1352	120", 131" or 135" Instruction Sheets, box 2	1